

MOTOR ACTUATION DEVICE FOR CAMERA

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a motor actuation device for a camera, and more particularly to a motor actuation device including a photo sensor for detecting the amount of a rotation caused by a motor in a photoelectrical manner.

10 2. Description Related to the Prior Art

 In a camera, a motor actuates to move a whole or a part of a taking lens along an optical axis for zooming and focusing. When zooming or focusing is carried out, a lens barrel or a lens holder moves and contacts a brush and a slide segment to
15 generate electric signals. The electric signals are used for monitoring. In order to know the amount of the movement more correctly, it is often detected by a photo detector. The Japanese Patent Laid-Open Publication No. H9-274229 discloses a motor actuation device. In the motor actuation device, a
20 motor gear for driving a lens moving mechanism is fixed at an end of a rotary shaft of motor, and an impeller is fixed at another end of the rotary shaft. A rotation of the impeller is detected by a photo interrupter, and the amount of the rotation is calculated in accordance with detection signals from the
25 photo interrupter.

 It is effective to decelerate rotation between a motor gear fixed to a motor shaft and a first gear meshed with the motor gear in order to drop a sound of the motor actuation device. In the Japanese Patent Laid-Open Publication No.
30 H5-11322, a worm gear is fixed to the rotary shaft of the motor, and meshed with a worm wheel. The worm wheel rotates more slowly

than the worm gear.

It is difficult to fix an impeller of a large diameter to the worm gear. When the worm gear fixed on the rotary shaft drives the worm wheel, the worm wheel is located near the rotational axis of the motor. Furthermore, the impeller is hardly to fix to a rotary shaft of the motor without collapsing the worm wheel, because it is necessary to keep a space therefore. Accordingly, the impeller is usually provided for the gear train following the worm wheel. However, in this structure, the amount of rotation of the rotary shaft of the motor is not correctly detected because the rotation of the impeller is reduced.

Preferably, the impeller is not disposed after the speed accelerate gear train, in order to keep the number of the gears so small that the cost may be low, and the amount of back crush between the gears be decreased, which causes the incorrect detection for the amount of the rotation of rotary shaft. As disclosed in Japanese Patent Laid-open Publication No. H9-274229, the impeller can be fixed to another end of the rotary shaft. However, in this structure, the motor is specifically produced, which increases the cost. Further, a space along the rotary shaft is necessary.

SUMMARY OF THE INVENTION

In view of the forgoing, an object of the present invention is to provide a motor actuation device whose cost for production is low, and which is loaded in a small space.

Another object of the present invention is to provide a motor actuation device which can precisely detect an amount of rotation caused by a motor.

A second object of the present invention is to provide

a motor actuation device in which a reduction mechanism including a worm gear is used and rotational speed is reduced so much.

In order to achieve the above objects, a motor actuation
5 device of the present invention causes to rotate a impeller.
A blade of the impeller is detected by the photo sensor. The
worm gear is fixed to a rotary shaft of the motor, and a first
spur gear is fixed to the rotary shaft. The idle gear is meshed
with the first spur gear and the second spur gear of the
10 impeller. When the motor drives, the worm gear and the first
spur gear rotate. The rotation of the worm gear is transmitted
through the worm wheel to the photographic mechanism. The photo
sensor detects the blade and generates the pulse when the
impeller rotates at a predetermined angle.

15 The first spur gear is integrally formed with the worm
gear. As the first spur gear has a smaller diameter than the
worm gear, the first spur gear does not collide with the worm
wheel.

The worm wheel is molded integrally with the spur gear
20 portion whose diameter is smaller than that of the worm wheel.
The rotation of the spur gear portion is transmitted through
the gear train to a camera mechanism.

According to the present invention, the rotation caused
by the motor is transmitted with a small number of gears. And
25 the small reduction ratio makes the amount of the rotation of
the motor precisely detected. The small number of gears
decreases the cost.

BRIEF DISCRIPTION OF THE DRAWINGS

30 The above objects and advantages of the present
invention will become easily understood by one of ordinary